

Works referred to.

- (1) H. G. SEELEY: "On the Skeleton in new Cynodontia from the Karroo Rocks." Phil. Trans. vol. 186 B. p. 59 (1896).
 (2) H. GADOW: 'Amphibia and Reptiles.' London, 1901.
 (3) H. G. SEELEY: "On the Gomphodontia." Phil. Trans. vol. 186 B. p. 1 (1896).

EXPLANATION OF PLATE XVIII.

Fig. 1. Occiput and upper cervical vertebrae of *Gomphognathus kannemeyeri*. Nat. size.

Fig. 2. Under view of atlas and axis of *Gomphognathus*. Nat. size.

Fig. 3. Posterior view of atlas &c. of *Trirachodon kannemeyeri*. Nat. size.

Fig. 4. Under " " " " " " Nat. size.

Fig. 5. Side " " " " " " Nat. size.

at., atlas; *ax.*, axis; *e.o.*, exoccipital; *h.at.*, hypophysis of atlas; *o.c.*, occipital condyle; *o.p.*, odontoid process; *p.a.*, proatlas; *r³, r⁴*, ribs; *r.at.*, atlas rib; *r.ax.*, axis rib; *sq.*, squamosal; *z.at.*, zygapophysis of atlas; *z.ax.*, zygapophysis of axis; *3c*, *4c*, 3rd and 4th cervical vertebrae.

4. A Revision of the Fishes of the Genus *Triacanthus*.

By C. TATE REGAN, B.A.¹

[Received January 20, 1903.]

Although six species of *Triacanthus* were described and figured by Bleeker in the 'Atlas Ichthyologique,' Günther, in his Catalogue, recognized only three (viz.: *Tr. strigilifer* Cantor, *biaculeatus* Bloch, and *brevirostris* Schlegel), and did not accept either of the four described by Dr. Bleeker as new, but placed three of them (viz.: *Tr. macrurus*, *blochi*, and *oxycephalus*) in the synonymy of *Tr. biaculeatus*, and the fourth (*Tr. nieuhofti*) in that of *Tr. brevirostris*. Since then this arrangement has not been challenged, nor has any new species of this genus been described.

Subsequent to the reading of my paper on the Plectognathi², I examined the specimens of *Triacanthi* in the British Museum Collection, which include Bleeker's types, and I have come to the conclusion that all six species described by Bleeker are valid, although the one he called *Tr. macrurus* is certainly identical with *Tr. biaculeatus* Bl., a species not recognized by him; whilst a seventh species, which has been generally confused with *Tr. brevirostris* Schleg., is now described for the first time as *Tr. indicus*. A complete revision of the synonymy has thus become necessary, and the need for more complete diagnoses of the various species is obvious. In the descriptions given below, which are in each case based on several specimens, the total length is measured to the base of the first caudal ray, the length of head to the gill-opening, the length of the caudal peduncle from the base of the last dorsal to that of the first caudal ray, the length of the snout from its tip to the vertical from the anterior margin of the eye, that of the

¹ Communicated by G. A. BOULENGER, F.R.S., V.P.Z.S.

² P. Z. S. 1902, ii. p. 284.

postorbital part of the head from the vertical from the posterior margin of the eye to the gill-opening. Young specimens have a shorter snout, a deeper body, and longer dorsal and ventral spines than adults, and have been excluded from the diagnoses. In each case the total length of the largest example here described is given.

TRACANTHUS Cuvier.

Body compressed, covered with small rough scales; caudal peduncle more or less elongate, tapering; mouth small; teeth in 2 series in each jaw, 10 in each outer series, incisor-like; those of the inner series obtuse, rounded, 6 in the upper jaw, 2 in the lower. Branchiostegals 6; pseudobranchiæ present. Spinous dorsal with 5 rays, the first a long and strong spine; soft dorsal with 20-25 rays; anal with 15-20 rays; ventral fins each represented by a strong spine, without soft rays; caudal widely forked. Vertebrae 20.

In all the species the colour is strikingly similar, being bluish grey above, silvery below. The only tangible differences in colour are that the membrane of the spinous dorsal fin is in some specimens immaculate, in others wholly or partly blackish.

Key to the Species.

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| I. Second ray of spinous dorsal more than half as long as the first, membrane of spinous dorsal immaculate; length of base of anal half that of soft dorsal; D. V, 20-22; A. 15-16 | 1. <i>Tr. strigilifer</i> Cantor. |
| II. Second ray of spinous dorsal less than half as long as the first. | |
| A. Snout concave; pelvis between ventral spines tapering to a distinct point posteriorly. | |
| a. Membrane of spinous dorsal immaculate; length of caudal peduncle $4\frac{1}{2}$ - $5\frac{1}{2}$ times in total length; length of base of anal $1\frac{3}{4}$ - $1\frac{5}{8}$ times in that of soft dorsal; D. V, 22-23; A. 16-17 | 2. <i>Tr. blochi</i> Bleeker. |
| b. Membrane between first two rays of spinous dorsal blackish; length of caudal peduncle $4\frac{1}{2}$ -5 times in total length; length of base of anal $1\frac{2}{5}$ - $1\frac{3}{5}$ times in that of soft dorsal; D. V, 23-24; A. 18-19 | 3. <i>Tr. bicuculatus</i> Bloch. |
| c. Membrane of spinous dorsal immaculate; length of caudal peduncle $6\frac{1}{3}$ -7 times in total length; length of base of anal $1\frac{2}{5}$ - $1\frac{3}{5}$ times in that of soft dorsal; D. V, 24-25; A. 17-19 | 4. <i>Tr. oxycephalus</i> Bleeker. |
| B. Snout straight; pelvis between ventral spines scarcely narrowed posteriorly; D. V, 24-25; A. 18-20. | |
| a. Membrane of spinous dorsal blackish; snout half as long as the head; postorbital part of head not shorter than eye-diameter | 5. <i>Tr. brevirostris</i> Schlegel. |
| b. Membrane of spinous dorsal blackish; snout more than half as long as the head; postorbital part of head shorter than eye-diameter. | 6. <i>Tr. indicus</i> , n. sp. |
| c. Membrane between first two rays of spinous dorsal blackish; snout less than half as long as the head; postorbital part of head shorter than eye-diameter | 7. <i>Tr. nieuhofti</i> Bleeker. |

TRIACANTHUS STRIGILIFER.

Triacanthus strigilifer Cantor, Mal. Fish. p. 363, pl. ix. (1847); Bleeker, Atlas Ichth. v. p. 89, pl. ccxxix. fig. 3 (1865); Günther, Cat. viii. p. 211 (1870).

Triacanthus longirostris Hollard, Ann. Sci. Nat. (4) i. 1854, p. 46, pl. ii. fig. 3.

Depth of body about equal to the length of head, about 3 times in the total length, length of caudal peduncle $4\frac{1}{2}$ –5 times. Snout very slightly concave, its length $1\frac{3}{5}$ – $1\frac{3}{4}$ times in that of the head, eye-diameter 3–4 times, interorbital width 4–5 times. Interorbital space concave, without distinct median ridge. Upper edge of occipital crest in the same straight line as that of the snout; distance to base of first dorsal spine from posterior margin of eye about $1\frac{1}{2}$ times the eye-diameter. D. V, 20–22; A. 15–16; the first dorsal spine longer than the head, the second considerably more than half as long as the first, the others much shorter; the base of the anal fin about half as long as that of the soft dorsal fin; pelvis between the ventral spines moderately broad, tapering to a point posteriorly. Membrane of spinous dorsal immaculate.

Total length 185 mm.

Hab. Seas of Arabia and India; East Indian Archipelago.

TRIACANTHUS BLOCHI.

Triacanthus blochi Bleeker, Nat. Tijds. Ned. Ind. iii. 1852, p. 81; Atlas Ichth. v. p. 89, pl. ccxvii. fig. 1 (1865).

Triacanthus biaculeatus (part.) Günther, Cat. viii. p. 210 (1870).

Depth of body about 3 times in the total length, length of head $3\frac{1}{2}$ – $3\frac{4}{5}$ times, length of caudal peduncle $4\frac{1}{2}$ – $5\frac{1}{4}$ times. Snout concave, its length $1\frac{4}{5}$ –2 times in the length of head, eye-diameter 3 – $3\frac{3}{4}$ times, interorbital width 4–5 times. Interorbital space concave, with median ridge scarcely, if at all, distinct. Upper edge of occipital crest forming an angle of about 160° with that of the snout; distance from posterior margin of eye to base of first dorsal spine about $1\frac{1}{4}$ times as long as the eye-diameter. D. V, 22–23; A. 16–17; the first dorsal spine longer than the head, the others short; length of base of anal fin $1\frac{3}{4}$ – $1\frac{4}{5}$ times in that of the base of soft dorsal fin. Pelvis between ventral spines narrow, tapering to a slender point. Membrane of spinous dorsal immaculate.

Total length 150 mm.

Hab. East Indian Archipelago; China.

TRIACANTHUS BIACULEATUS.

Balistes biaculeatus Bloch, Ausl. Fische, pl. 148. fig. 2 (1785).

Triacanthus biaculeatus Cuv. Règne An. ii. p. 152 (1817).

Triacanthus angustifrons Hollard, Ann. Sci. Nat. (4) i. 1854, p. 45, pl. ii. fig. 2.

Triacanthus macrurus Bleeker, Atlas Ichth. v. p. 91, pl. cccxii. fig. 3 (1865).

Triacanthus biaculeatus (part.) Günther, Cat. viii. p. 210 (1870).

Depth of body about $2\frac{4}{5}$ times in the total length, length of head about $3\frac{1}{2}$ times, length of caudal peduncle $4\frac{1}{2}$ -5 times. Snout concave, its length $1\frac{3}{5}$ - $1\frac{4}{5}$ times in the length of head, eye-diameter $3\frac{1}{2}$ -4 times, interorbital width 4-5 times. Interorbital space concave, with median ridge scarcely, if at all, distinct. Upper margin of occipital crest forming an angle of about 170° with that of the snout; distance from posterior margin of eye to base of first dorsal spine $1\frac{2}{5}$ - $1\frac{3}{5}$ times as long as the eye-diameter. D. V, 23-24; A. 18-19; the first dorsal spine longer than the head, the others short; length of base of anal fin $1\frac{2}{5}$ - $1\frac{3}{5}$ times in that of the base of the soft dorsal fin; pelvis between ventral spines rather narrow, tapering posteriorly to a slender point. Membrane between first and second rays of spinous dorsal fin blackish.

Total length 180 mm.

Hab. East Indian Archipelago; Australia; China.

TRACANTHUS OXYCEPHALUS.

Triacanthus oxycephalus Bleeker, Verh. Bat. Gen. xxiv. 1852, p. 27, pl. v. fig. 10; Atlas Ichth. v. p. 90, pl. cccx. fig. 3 (1865).

Triacanthus biaculeatus (part.) Günther, Cat. viii. p. 210 (1870).

Depth of body $2\frac{1}{3}$ - $2\frac{1}{2}$ times in total length, length of head about 3 times, length of caudal peduncle $6\frac{1}{3}$ -7 times. Snout slightly concave, its length about $1\frac{1}{3}$ times in the length of head, eye-diameter 3-4 times, interorbital width 3 - $3\frac{1}{4}$ times. Interorbital space flat. Upper edge of occipital crest convex; distance from posterior margin of orbit to base of first dorsal spine about $1\frac{3}{4}$ times as long as the eye-diameter. D. V, 24-25; A. 17-19; first dorsal spine longer than the head, the others short; length of base of anal fin $1\frac{2}{5}$ - $1\frac{3}{4}$ times in that of the base of the soft dorsal fin; pelvis between the ventral spines broad anteriorly, tapering to a point posteriorly. Membrane of spinous dorsal fin immaculate.

Total length 140 mm.

Hab. East Indian Archipelago.

TRACANTHUS BREVIROSTRIS.

Triacanthus brevirostris Schlegel, Faun. Japon., Poiss. p. 294, pl. cxxix. fig. 2 (1846); Bleeker, Atlas Ichth. p. 94, pl. cccxxi. fig. 3 (1865); Günther, Cat. viii. p. 209, part. (1870).

Triacanthus biaculeatus Bleeker, Verh. Bat. Gen. xxii. 1849, p. 6.

Triacanthus rhodopterus Bleeker, Verh. Bat. Gen. xxiv. 1852, p. 25, pl. iv. fig. 8.

Triacanthus russellii Bleeker, t. c. p. 25.

Depth of body $2\frac{1}{2}$ - $2\frac{3}{4}$ times in the total length, length of head $3\frac{1}{4}$ - $3\frac{3}{4}$ times, length of caudal peduncle $4\frac{3}{4}$ - $5\frac{1}{2}$ times. Snout straight, its length about twice in that of the head, eye-diameter $3\frac{1}{2}$ -5 times, interorbital width about $3\frac{1}{2}$ times. Length of post-

orbital part of head equal to or greater than eye-diameter. Interorbital space with a more or less distinct median ridge, with a groove on each side of it. Occipital crest convex, moderately elevated, becoming nearly horizontal in front of the base of the first dorsal spine. D. V, 24-25; A. 18-20; first dorsal spine shorter than the head, the others short; length of base of anal fin $1\frac{2}{5}$ - $1\frac{3}{5}$ times in that of soft dorsal fin; pelvis between ventral spines broad, scarcely narrowed posteriorly. Membrane of spinous dorsal fin blackish.

Total length 250 mm.

Hab. East Indian Archipelago, Seas of China and Japan.

TRIA-CANTHUS INDICUS, n. sp.

Russell, Indian Fishes, p. 14, pl. xxi. (1803).

Balistes biaculeatus Bennett, Fishes of Ceylon, pl. xv. (1830).

Triacanthus biaculeatus Cantor, Mal. Fish. p. 360 (1847); Day, Fishes of Malabar, p. 260 (1865).

Triacanthus brevisrostris Hollard, Ann. Sci. Nat. (4)i. 1854, p. 45, pl. ii. fig. 1; Günther, Cat. viii. p. 209, part. (1870); Day, Fishes of India, p. 685, pl. clxxv. fig. 1 (1878).

Depth of body $2\frac{1}{3}$ - $2\frac{2}{3}$ times in the total length, length of head $3\frac{1}{4}$ - $3\frac{1}{2}$ times, length of caudal peduncle $4\frac{1}{4}$ -5 times. Snout straight, its length about $1\frac{3}{4}$ times in that of the head, eye-diameter $3\frac{1}{4}$ - $4\frac{1}{4}$ times, interorbital width 3- $3\frac{3}{4}$ times. Length of postorbital part of head distinctly less than eye-diameter. Interorbital space with a more or less distinct median ridge with a groove on each side of it. Occipital crest elevated, its upper edge nearly in the same straight line with that of the snout. D. V, 24-25; A. 18-20; first dorsal spine nearly as long as the head, the others short; length of base of anal fin $1\frac{1}{3}$ - $1\frac{1}{2}$ times in that of soft dorsal fin; pelvis between ventral spines broad, scarcely narrowed posteriorly. Membrane of spinous dorsal fin blackish.

Total length 220 mm.

Hab. Coasts of India from Kurrachee to Penang; Ceylon; Andaman Is.

This species differs from *T. brevisrostris* chiefly in the longer snout, the shorter postorbital part of head, and the shorter and more elevated occipital crest. The figures given by Russell and Bennett are excellent.

TRIA-CANTHUS NIEUHOFI.

¹ Nieuhof, Gedenk. Zee en lantr. p. 272, fig.

Willoughby, Ichthyology, Appendix, p. 5, pl. x. fig. 2 (1686).

? Gronow, Mus. i. p. 52 (1754-6) & Zoophyl. p. 53 (1763-81).

Triacanthus nieuhofi Bleeker, Verh. Bat. Gen. xxiv. 1852, p. 26, pl. iv. fig. 9, & Atlas Ichth. v. p. 92, pl. ccxvii. fig. 3 (1865).

Triacanthus brachysoma Bleeker, Nat. Tijds. Ned. Ind. iv. 1853, p. 128.

¹ I have not been able to verify this reference.

? *Balistes bipes* Gronow, Cat. Fish. p. 37 (1854).

Triacanthus brevirostris (part.) Günther, Cat. viii. p. 209 (1870).

Depth of body about $2\frac{1}{3}$ times in the total length, length of head $3\frac{1}{2}$ – $3\frac{3}{5}$ times, length of caudal peduncle $4\frac{1}{3}$ – $4\frac{1}{4}$ times. Snout straight, about $2\frac{1}{5}$ times in the length of head; eye-diameter about $3\frac{1}{4}$ times and equal to interorbital width. Length of postorbital part of head less than eye-diameter. Interorbital space with median ridge with a groove on each side of it; occipital crest strongly elevated, the distance from the base of first dorsal spine to the upper angle of gill-opening rather more than the distance from the base of the first dorsal spine to the anterior margin of eye. D. V, 24–25; A. 18–20; first dorsal spine longer than the head, the others short; length of base of anal fin about $1\frac{1}{2}$ times in that of the base of soft dorsal fin; pelvis between the ventral spines broad, not much narrowed posteriorly; membrane between first two rays of spinous dorsal fin blackish.

Total length 126 mm.

Hab. East Indian Archipelago.

This species has a shorter and more declivous snout than *Tr. brevirostris*, and also occipital crest more elevated, postorbital part of head shorter and body deeper.

5. On the Geographical Variations of the Sand-Viper, *Vipera ammodytes*. By G. A. BOULENGER, F.R.S., V.P.Z.S.

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(Text-figures 27 & 28.)

The variations of *Vipera ammodytes* in connection with the distribution of the species have not received sufficient attention. Having succeeded in bringing together and carefully comparing a series of 55 specimens from various localities, I have convinced myself that the South-eastern specimens (Greece, Archipelago, Syria) can be distinguished from the typical form from Austria-Hungary, Dalmatia, Bosnia, and Montenegro, not by means of any single absolute character, but by a combination of characters, as shown by the following definitions:—

Forma typica (text-fig. 27 a).—Naso-rostral shield usually¹ reaching the canthus rostralis, and extending considerably higher up than the upper border of the rostral, which is usually broader than deep (text-fig. 28 a); rostral "horn" with 3 (rarely 2 or 4) transverse series of scales between the rostral shield and the apex. Ventral shields 145 to 163. The dark shade on the lower lip, if present, broken up by light bars separated by 2 to 4 labial shields. Lower surface of end of tail usually red². Grows to 80 centimetres.

Var. *meridionalis* (text-fig. 27 b).—Naso-rostral shield never

¹ 5 exceptions out of 30 specimens examined

² Yellow in one specimen from the Dinaric Alps, Bosnia.